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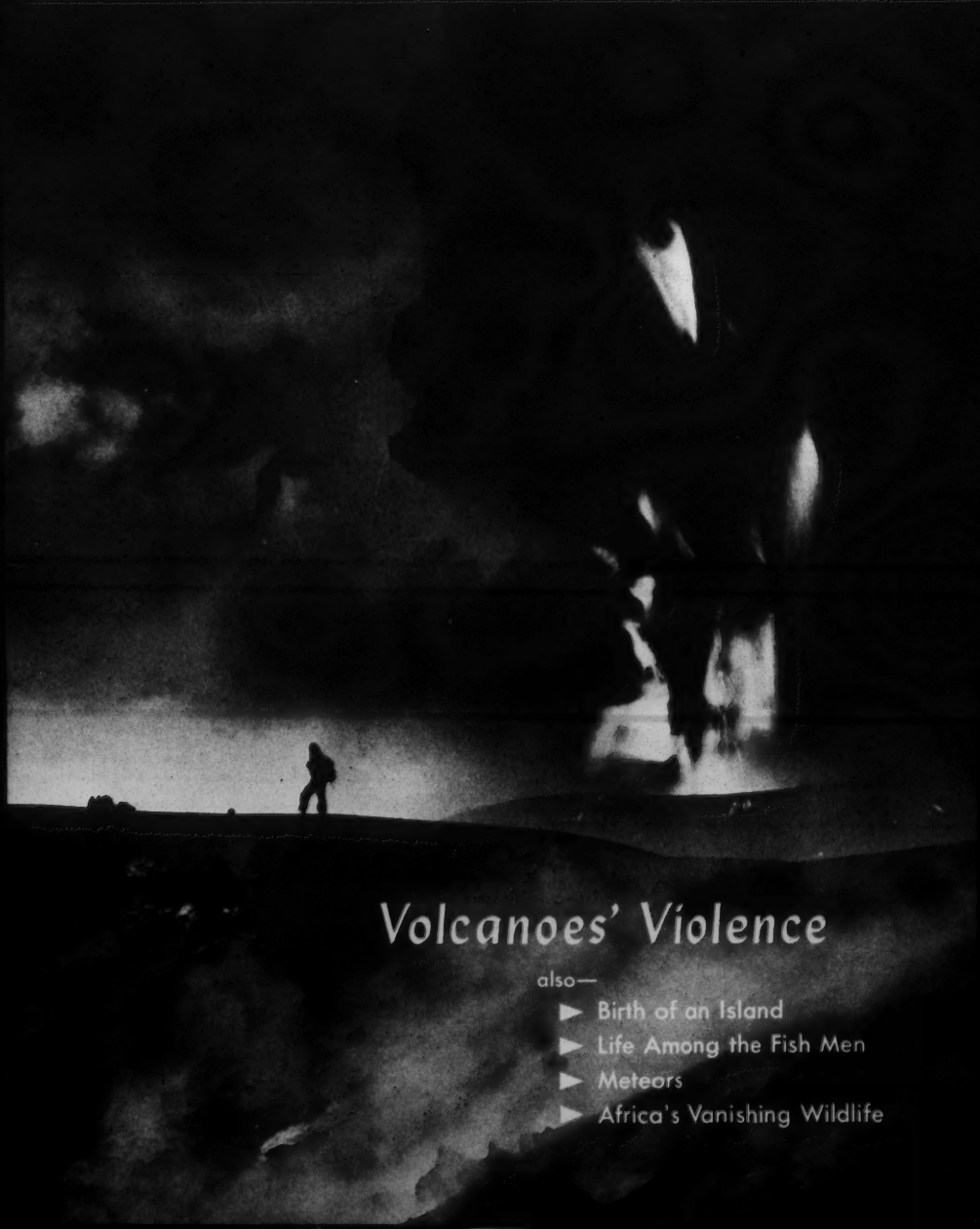

Volcanoes' Violence

also—

- Birth of an Island
- Life Among the Fish Men
- Meteors
- Africa's Vanishing Wildlife

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year); Canada, $2.25; elsewhere, $2.50. U. S. only, 5 years (90 issues), $5.00.
is a nonprofit educational and scientific society established for the increase and diffusion of geographic knowledge.

in both Asia and the Americas; striping southern Europe and Asia from the Canary Islands and the Azores to East Pakistan; and running north and south along east Africa.

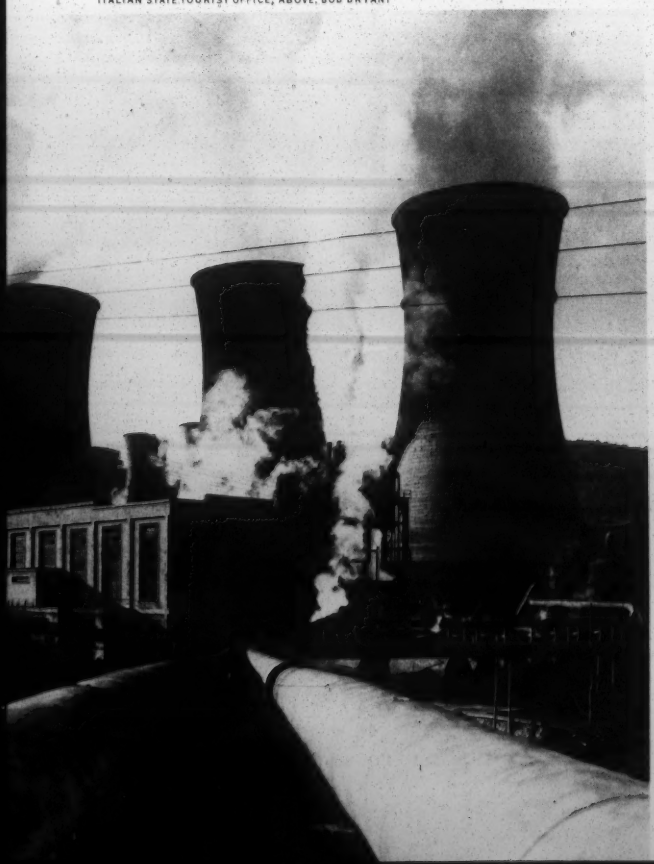
These volcanic belts parallel earthquake zones, and scientists believe the two are related. The shift in the earth's crust that releases the molten fury also triggers the earthquake.

For centuries men were helpless before forces they believed to be the mighty artillery of whimsical gods. They offered sacrifices and prayers, hoping to be spared flaming death.

But prayers availed little. Mount Vesuvius destroyed Pompeii and Herculaneum in 79 A.D. The explosion of Krakatau, off Indonesia, in 1883, generated huge sea waves which killed 36,000 people on Sumatra and Java. In 1902 Mount Pelée on the island of Martinique erupted, obliterating the city of St. Pierre and killing 30,000 people.

Today man can avoid some of the volcano's violence. Close watch is kept on those that show signs of activity; alarm systems warn of approaching danger. Bombing diverts lava flows.

ITALIAN STATE TOURIST OFFICE, ABOVE, BOB BRYANT



The erupting volcano has yet to be tamed, but less violent earth fires power industry and heat homes.

Engineers at Larderello, Italy, which lies on a subterranean boiler, drilled down 2,000 to 3,000 feet where they captured a volcano's steam and funneled it to a power plant, left.

Iceland's hot springs supply heat for nearly 3,500 homes.

Volcanoes push to the surface minerals that plants need, attracting farmers to the enriched soil. The areas around Vesuvius and Etna are famous for vineyards and orchards. L.B.

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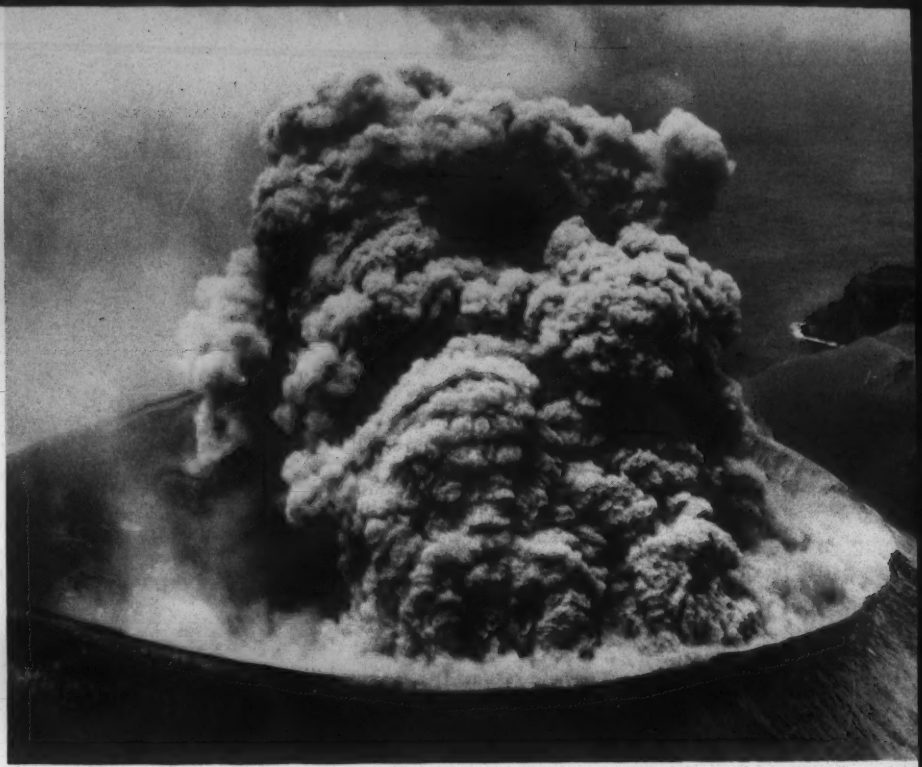

U. S. NAVY; COVER, HUGO BREHME

When Earth Fires Burst Forth

THIRTY MILES beneath the earth's surface, molten rock strains for release from the tremendous weight of the crust above. Suddenly a shift in the crust cracks the prison wall. Molten rock rushes out, pushing toward the surface. The lava boils over the land with a force that dwarfs the H-bomb's. Smoke, steam, and ash pour into the sky. A volcano is born.

Some 500 volcanoes in various stages of activity spot the earth. Stromboli, in the Mediterranean, continually glows and smokes. Dormant since 1914, Minami Dake, Japan, erupted in 1946. Its tumbling boulders of steaming lava chase a sight-seer, below. Again in 1955 it exploded, and has been erupting intermittently ever since. Kilauea Iki, on the island of Hawaii, erupted in November, 1959, after a 91-year nap. In addition, the gouged-out craters of thousands of extinct volcanoes top mountain peaks around the world.

As the old die, new ones are born. The most famous birth was that of Parícutin (cover) about 200 miles west of Mexico City in 1943. As a farmer plowed his cornfield, smoke billowed out of the ground at his feet, the earth cracked, and fiery lava bathed surrounding villages. Within six months Parícutin raised itself 1,000 feet in the air. Boquerón, above, was born on a Mexican island in 1952.

However, geological odds are against a New Yorker seeing a volcano erupt from the grass of Central Park or a Midwesterner finding one in his cornfield. Volcanoes follow definite patterns around the earth: bordering the Pacific Ocean

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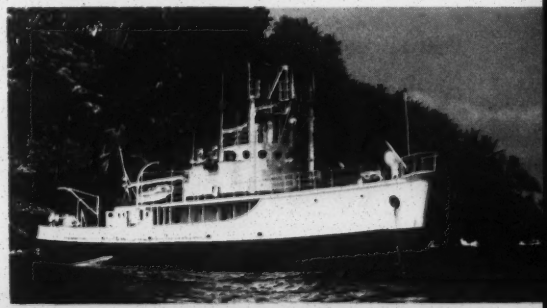
My Cruise With the Fish Men

Nathaniel T. Kenney, National Geographic senior staff, recently joined Captain Jacques-Yves Cousteau's famous oceanographic ship Calypso *for a voyage from Norfolk, Virginia, to the Caribbean, where with Aqua-Lung and miniature submarine (below) her crew carried out research sponsored in part by the National Geographic Society.*

By Nathaniel T. Kenney

AT EVERY PORT *Calypso* touches, she is besieged by dozens of eager young men, begging to participate in her underwater adventures and scientific work. If they could come along, what would they find?

The *Calypso* (right) is a happy ship; its crew (averaging perhaps 30 years old) is a distinct breed—fish men. Diving with their Aqua-Lungs, they seem to become fish—they swim like fish, even think like fish. So they understand fish as earthbound men cannot. Once, in the pulpit above *Calypso's* bow, I was chatting with chief diver Albert Falco as we crossed the green Gulf Stream. The barracuda was mentioned. "Ah, yes," said Falco. "The barracuda! A fish most amiable!"



The shark? "The shark is an animal to be respected. The shark eats meat, and among the things that are made of meat are human beings. But humans are not the shark's usual prey, so usually they don't bother you. We try to build up mutual respect."

All 25 members of the crew,

JACQUES ERTAUD; ABOVE, NATIONAL GEOGRAPHIC PHOTOGRAPHER BATES LITTLEHALES

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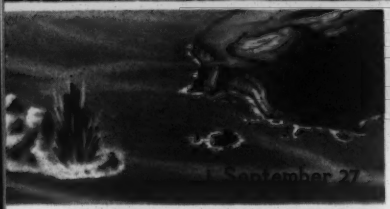
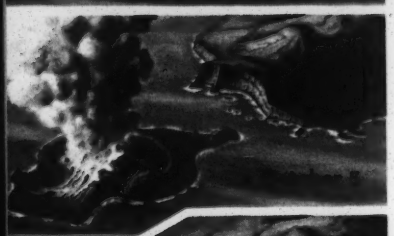
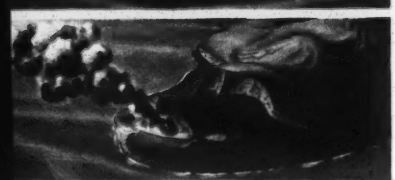
NATIONAL GEOGRAPHIC PHOTOGRAPHER ROBERT F. SISSON; DRAWINGS BY JOHN L. LOUGHLIN







Volcano Builds an Island

GREEN FIELDS and blooming gardens lie buried in a coffin of volcanic ash on 12-by-8-mile Fayal Island in the Azores. A backdrop of smoke from the volcano in the sea tells villagers their troubles are not over.

The destruction is the work of Ilha Nova (New Island) which burst from the Atlantic on September 27, 1957, after a week of earthquake tremors (1). In three days it rose 150 feet from the ocean floor. A kidney-shaped cone formed (2). On the morning of October 30, villagers awoke to find only a circle of bubbles where Ilha Nova had stood (3).

A few days later, the island volcano rose again, but slipped back under the waves the next day. Then on November 6 the hot caldron of the sea spewed out boiling gases to announce the rebirth of Ilha Nova. Drawings 4 and 5 show how the second island has grown into a half-mile peninsula of Fayal.

The exact moment and spot for Ilha Nova's entrance into the world could not have been predicted, but scientists were not surprised when it appeared. A crack in the earth's crust splits Fayal. At least three previous eruptions—the last in 1672—have occurred there.

Eventually the volcano on Ilha Nova will grow quiet, then die. Erosion will smooth the peninsula's scarred face; plants will gain a foothold. One day the new land may bloom as luxuriantly as the rest of the Azores.

Breakfast is French-style: hot chocolate and bread and butter. The crew drifts into the wardroom from 7 to 9 a.m., whenever duties permit.

On deck (above) it is sometimes hard to decide who's on watch.

Divers and mechanics work over their apparatus, including the new "diving saucer" seen in the aft hold.

Many spend their spare time reading or studying. I was able to help several with their English studies. In return they taught me the sailor's French that is the ship's language.

Music is piped from the radio shack to loud-speakers around the ship. The recordings are all on tape—records might bounce off the turntable in a heavy sea. When I joined her, *Calypso* had just spent several weeks in United States ports and had acquired a stock of rock 'n' roll which alternated with classics.

They had also taken aboard many cases of American root beer, and stocks of ordinary white bread, which they relished as a change from the crusty French loaf. Some had even acquired a craving for peanut butter.

Lunch and dinner, served in two shifts, were magnificent French cooking by any standard. The same meal never appears twice. There was surprisingly little fish, although the *Calypso* has a tradition that anything that comes out of the sea is edible. They have munched shark and ray as well as an almost infinite variety of fishes.

When *Calypso* is not working, but simply sailing to the place she will work, there is plenty of spare time. The crew can get up an impromptu concert with native instruments they picked up in Africa (left) or linger long after meals discussing anything under the sun.

Sometimes the first mate, a quiet man, would wink at me over dinner and then mention some subject he knew would start the men going.

NATIONAL GEOGRAPHIC PHOTOGRAPHER BATES LITTLEHALES

It might be anything from the origin of a word to Joan of Arc or *le grand Charlie*—Charles de Gaulle. We'd sit back and watch the men tear into it, with great French fervor and much arm waving and reference to books in the library. Long into the night the discussion would continue over glasses of wine and endless cups of tea. The men leaving the dining area to go on watch would continue talking in twos and threes all over the ship as we sailed through the South Atlantic swells, the stars bright above, the flying fish skittering over the water.

For a true fish man, such activities are pleasant, but not to be compared to life underwater.

One lovely night Falco sighed, "Ah, Nat! Three months at sea for a few days diving! Diving is my life! If I could only get off the ship and swim along beside! Then I'd be happy!"

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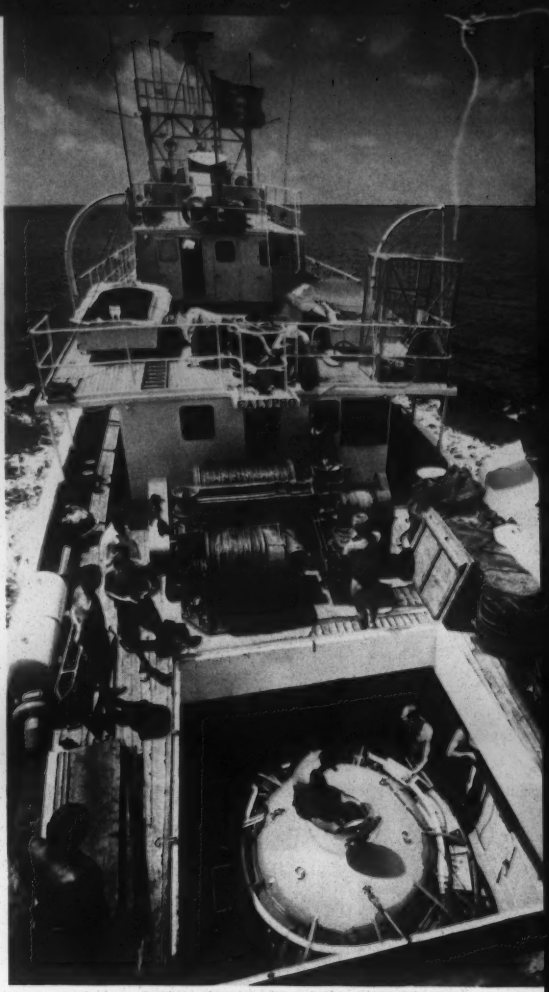
from Captain Cousteau to the mess boy, are qualified divers. They are what the French call the "type sportive." Their enthusiasm for adventure makes them skiers, cave explorers, mountain climbers, in addition to undersea divers.

When I was aboard, I found them a delightful bunch, hard-working, playful, interested in a wide variety of nondiving subjects.

Their vessel, the *Calypso,* is a converted World War II minesweeper, about 140 feet long, which means she is a miserable sea boat—she rolls and pitches enough to make a bronze statue seasick—but I never saw a crew member sick.

But *Calypso* is, as sailors say, able. She can take anything the sea has to offer. I'd rather tackle a hurricane in her than in the *Queen Mary.*

That's just as well, because we flirted with a hurricane on our trip to Puerto Rico. Hurricane Gracie showed an ungracious inclination to follow us around. We were sailing well east of its center when it veered toward us and threatened to chase us to Africa. The waves towered above the deck, and *Calypso* rolled as far as 40 degrees—but she always rolled back.



THOMAS J. ABERCROMBIE, NATIONAL GEOGRAPHIC STAFF

In weather like that, it is impossible to get any real sleep. You just get settled down in your bunk when along comes that seventh wave and pitches you right out on the deck.

So you sleep in cat naps sitting up wedged in corners or in a lifeboat while off watch. You get used to it.

Eating becomes a problem, too. The table cloth is removed to show the table full of small holes. You fence in your plate with wooden pegs to hold it in place. Occasionally, a bowl of soup will jump clear out of its pegs, sail along an inch above the table, and land in the captain's lap. He's used to that, too.

The cook has his problems—he may have to work on his hands and knees on the floor with his bowl wedged into a corner. The mess boy may be carrying a two-foot stack of glass bowls when the big wave hits. I've seen him fall full length, still holding his burden upright. He gets bruised, but the dishes are never cracked.

In calmer weather, the routine day is relaxed, with no show of formal discipline. Everyone knows his job and goes about it on his own. All stand regular watches, four hours on duty, eight off. No bells summon them to duty, each keeps his own time. On seeing one another for the first time each day, they always shake hands—very formal, very French.

"something in the sky," to today's belief that some may be asteroids, but most are debris scattered by comets.

(See previous articles in this series, *Geographic School Bulletins,* April 11, 1960, Comets; January 25, 1960, Asteroids.)

There are several clues. Meteorites can be divided into three types:

1. Iron meteorites, which also contain nickel and other elements
2. Stony meteorites, chiefly silica and aluminum oxide
3. Mixed iron and stone.

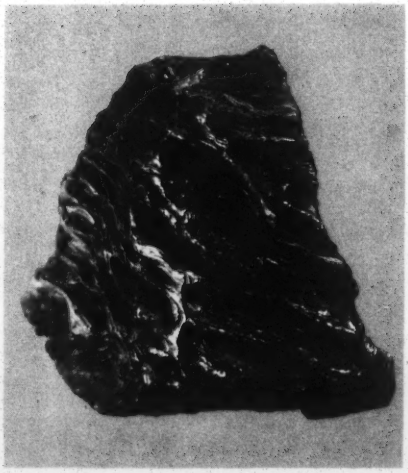
These three kinds, some theorists say, could have come from the breakup of a planet like Earth—bits from the core, the crust, and in-between. Or perhaps they are the debris of a collision between two planets.

This theory is in accord with a popular theory in regard to the asteroids and would indicate that the larger meteorites are actually small asteroids.

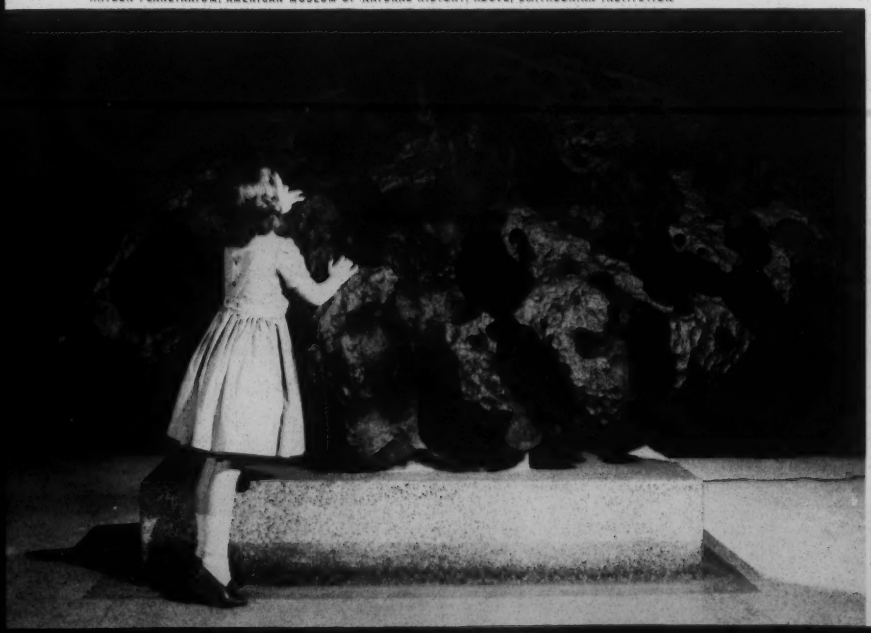
The vast majority, however, seem to be cast off from comets. Whenever Earth is passing through the orbit of a major comet, we experience "meteor showers." One is occurring now, as we whirl through the orbit of Halley's comet. No one can say in advance how heavy the shower will be.

If you want to see the best meteor show, don't stay up late; get up early. In the evening the dark side of the Earth faces away from the direction in which the Earth is moving. A meteor you see then has to be traveling in the same direction as Earth, and moving fast enough to catch up with it, like a fish overtaking the stern of a ship.

Just before dawn, our part of Earth is, in effect, the bow of the ship, overtaking the fish that swim away as well as the fish that swim toward us. At that time you can see three times as many meteors as in the evening. F.S.



HAYDEN PLANETARIUM, AMERICAN MUSEUM OF NATURAL HISTORY; ABOVE, SMITHSONIAN INSTITUTION



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ADAPTED FROM THE BALTIMORE SUN

WORLD'S LARGEST meteor hole, Chubb Crater in subarctic Canada, is shown superimposed on Baltimore. The crater is more than two miles across. The chances of such a huge meteorite striking a city are one in a hundred million.

The Solar System No. 10

METEORS

PERHAPS WE should put up a big sign: "Keep our solar system clean!"

For the reaches of space are dotted with celestial rubbish. Earth and the other planets, as they spin around the sun, act as giant dust rags, mopping the heavens a little cleaner each day.

When the "dust," called meteors, swings close, Earth's gravity pulls the fragments into the atmosphere, where most are consumed in a flash of fire we call a "shooting star."

Rushing from empty space, meteors slam like bricks against air molecules. Even in the near-vacuum 80 miles up, there are enough gas molecules to burn the intruder. Each molecule hit causes friction, and therefore heat.

The front edge of the meteorite is worn round; the iron or stone substance melts and wears off in rivers as shown in the picture below right. This meteorite, 1½ inches high, landed in Pima County, Arizona.

Most meteors are consumed before they come within 50 miles of Earth. But some survive the burning journey and land on our planet—the only non-Earth things we are privileged to touch.

A meteor that survives the trip is called a meteorite. Some 1,700 pieces of this space flotsam have been positively identified on the planet.

One, still buried in South West Africa, is estimated to weigh 60 tons. The Willamette meteorite, largest found in the United States, bottom, weighs 15½ tons. The deep cuts on its side were burned there during its fall through the atmosphere. Meteorites range downward in size to the much more plentiful micrometeorites, invisible unless burning bright in the night sky. About a billion of these incinerate themselves over our heads each day.

The total "catch" on our planetary dust rag is about 3,000 tons a day.

Where does all this space-trash come from? There have been several theories, ranging from the shoulder-shrugging of the ancient Greeks, who named them *meteors,* meaning simply

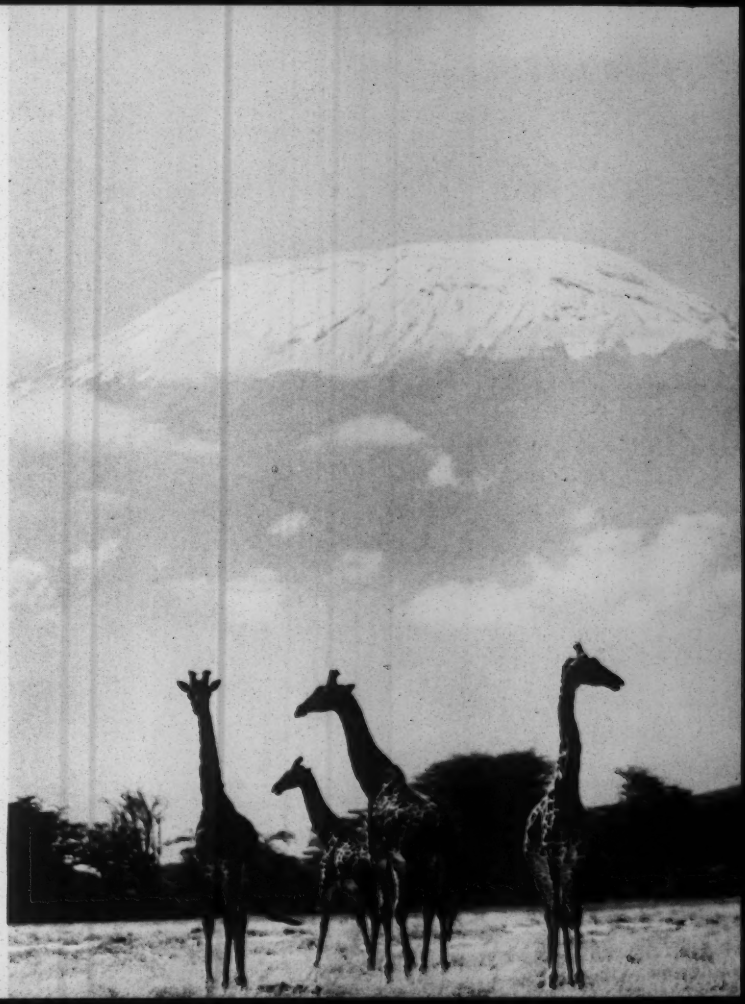
Now, men and livestock have multiplied beyond the point at which the drier regions can support them. One-third desert, Africa receives most of its rainfall from mists drawn up from forests. But Africans are rapidly cutting and burning the woodlands. While springs and streams go dry, overgrazing by domestic animals creates wasteland. The deserts spread.

Meat-hungry Africans seldom slaughter their livestock, their symbol of wealth. So while tribesmen illegally hunt and trap the last of Africa's fauna, their cattle drive wildlife away from water and choice grazing.

YLLA, RAPHO-GUILLUMETTE

Scientists fear that Africa is losing a valuable natural resource. Properly harvested, game herds could provide a permanent meat supply in areas unsuitable for livestock. Wildlife requires less water than domestic animals, and it does not overgraze its environment. The freely roving game in the national parks have made tourism one of East Africa's leading industries.

Africa must soon decide whether the majestic giraffes grazing under the shadow of Kilimanjaro will go the way of the American buffalo. G.D.



POACHING AND OVERGRAZING THREATEN

Africa's Great Game Herds

QUENTIN KEYNES; LEFT, KENYA WILD LIFE SOCIETY

MUSCLES STRETCHED, eye bright, the ivory poacher takes careful aim. His poisoned arrow hums toward the flank of a cow elephant browsing peacefully in one of Africa's great national parks. Trumpeting with pain, she probes the air with her trunk, trying to catch the scent of the concealed bowmen. Unable to detect her enemies, the doomed cow rushes blindly into the bush. Behind her, she leaves a bewildered calf to die of thirst.

A herd of graceful impala (above) explores a thorn fence mysteriously blocking its path to water. Suddenly, a doe lunges through an opening. A wire snare seizes her neck in the grip of death. Poachers have claimed yet another victim from the ranks of Africa's vanishing wildlife.

Fifty years ago, wild animals of many species blackened the plains of East and Central Africa in countless millions, as the bison darkened America's Great Plains.

EDGAR M. QUEENY

MASAI BOYS herd bony cattle on the floor of Ngorongoro Crater in Tanganyika. The dark areas have been eaten bare of grass, threatening the food supply of the wildebeest grazing in the background.